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First Named Inventor	IWAMURA, Takashige
Art Unit	2181
Examiner Name	Unassigned
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ENCLOSURES *(Check all that apply)*

- ☐ Fee Transmittal Form
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  - ☐ Affidavits/declaration(s)
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- ☒ Renewed Petition to Make Special
- ☐ Petition to Convert to a Provisional Application
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SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	Townsend and Townsend and Crew LLP		
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Printed name	Chun-Pok Leung		
Date	September 13, 2005	Reg. No.	41,405

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below.

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Typed or printed name	Joy Salvador	Date	September 13, 2005

PATENT
Attorney Docket No.: 16869P-112100US
Client Ref. No.: 340301728US1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

TAKASHIGE IWAMURA *et al.*

Application No.: 10/816,572

Filed: March 31, 2004

For: REMOTE COPY NETWORK

Customer No.: 20350

Examiner: Mano Padmanabhan

Technology Center/Art Unit: 2188

Confirmation No.: 1244

RENEWED PETITION TO MAKE SPECIAL FOR NEW APPLICATION UNDER M.P.E.P. § 708.02, VIII & 37 C.F.R. § 1.102(d)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Decision dated July 13, 2005 dismissing the original petition to make special, Applicants respectfully submit a renewed petition to make special the above-identified application under MPEP § 708.02, VIII & 37 C.F.R. § 1.102(d). The application has not received any examination by an Examiner.

(a) The Commissioner has previously been authorized to charge the petition fee of $130 under 37 C.F.R. § 1.17(i) and any other fees associated with this paper to Deposit Account 20-1430.

(b) All the claims are believed to be directed to a single invention. If the Office determines that all the claims presented are not obviously directed to a single invention, then Applicants will make an election without traverse as a prerequisite to the grant of special status.

(c) Pre-examination searches were made of U.S. issued patents, including a classification search and a computer database search. The searches were performed on or around September 2, 2004, and were conducted by a professional search firm, Kramer & Amado, P.C. The classification search covered Classes 711 (subclasses 11, 112, 161, and 162), 714 (subclasses 6 and 13), and 709 (subclasses 203, 217, and 219) for the U.S. and foreign subclasses identified above. The computer database search was conducted on the USPTO systems EAST and WEST. The inventors further provided seven references considered most closely related to the subject matter of the present application (see references #3-9 below), which were cited in the Information Disclosure Statement filed with the application on March 31, 2004.

(d) The following references, copies of which were previously submitted, are deemed most closely related to the subject matter encompassed by the claims:

(1) U.S. Patent Publication No. 2004/0044865 A1;

(2) U.S. Patent Publication No. 2004/0039888 A1;

(3) U.S. Patent Publication No. 2003/0051111 A1;

(4) U.S. Patent No. 6,209,002 B1;

(5) U.S. Patent No. 5,734,818;

(6) Japanese Patent Publication No. JP 2003-122509;

(7) Japanese Patent Publication No. JP 2000-305856;

(8) Japanese Patent Publication No. JP 07-244597; and

(9) European Patent Publication No. EP 1049016 A2.

(e) Set forth below is a detailed discussion of references which points out with particularity how the claimed subject matter is distinguishable over the references.

A. Claimed Embodiments of the Present Invention

The claimed embodiments relate to an information processing system comprising storage device, and more specifically, to remote copying and disaster recovery

technology, executed by a remote copy network comprising two or more storage devices and two or more network devices.

Independent claim 1 recites a remote copy network system having a first storage system and a second storage system, including a first edge device coupled to the first storage system, a second edge device coupled to the second storage system, the first edge device and the second edge device being coupled by a network. The first edge device receives a remote copy I/O request to copy data to the second storage system from the first storage system, and sends a response to the received remote copy I/O request to the first storage system. After sending a response to the remote copy I/O request, the first edge device sends to the second edge device log information having the remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request. The second edge device extracts the remote copy I/O request from the received log information, and sends the extracted remote copy I/O request to the second storage system according to the order indicated by the sequential number in the log information.

Independent claim 11 recites a relay device, coupled to a first storage system which relays a remote copy of data from the first storage system to a second storage system. The relay device comprises a first interface coupled to the first storage system; a second interface coupled to another relay device via a network, wherein the other relay device is coupled to the second storage system; a processor; and a memory. The first interface receives a remote copy I/O request for remote copying data from the first storage system to the second storage system, and returns a response to the remote copy I/O request to the first storage system. The processor creates and stores in the memory log information having a remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request. The second interface portion, after returning a response to the remote copy I/O request, sends the created log information to the other relay device. The second interface portion receives a response to the log information. The processor deletes from the memory the log information corresponding to the received response.

Independent claim 17 recites a relay device, coupled to a second storage system, for relaying remote copy data from a first storage system to the second storage system. The relay device comprises a first interface portion, coupled to another relay device

via a network, wherein the other relay device is coupled to the first storage system; a second interface, coupled to the second storage system; and a processor. The first interface portion receives, from the other relay device, log information having a remote copy I/O request for remote copying data from the first storage system to the second storage system and a sequential number indicating the order of reception at the other relay device of the remote copy I/O request. The processor acquires the remote copy I/O request from the received log information. The second interface portion sends the acquired remote copy I/O request, in the order of the sequential number comprised in the log information, to the second storage system.

One benefit that may be derived is that device ownership costs and management costs when executing multi-hop remote copying between storage devices can be reduced. See specification at page 3, lines 19-21.

B. Discussion of the References

1. U.S. Patent Publication No. 2004/0044865 A1

This reference discloses a method for transaction command ordering in a remote data replication system. A disaster-tolerant data backup and remote copy system which is implemented as a controller-based replication of one or more LUNs (logical units) between two remotely separated pairs of array controllers connected by redundant links. The system 100 operates based on the pairing of volumes (LUNs) on a local array with those on a remote array. Fig. 7 shows a flowchart of a synchronous system operation, and Fig. 8 shows a flowchart of an asynchronous system operation. The system 100 utilizes a log operation in response to a site failover (see Fig. 12), and employs a method to ensure the proper command ordering on the remote media (see Fig. 14). See [0100]-[0114].

The reference is directed to a method for allowing a large number of commands to be outstanding in transit between local and remote sites while ensuring the proper ordering of commands on remote media during asynchronous or synchronous data replication. Although it maintains the proper order of commands, it does not disclose the use of log information having a remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request. More specifically, the reference fails to

teach sending/receiving log information having a remote copy I/O request to copy data from a first storage system to a second storage system and a sequential number indicating the order of reception of the remote copy I/O request, and sending the extracted/acquired remote copy I/O request to the second storage system according to the order indicated by the sequential number (as recited in independent claims 1 and 17); or a relay device having a processor that creates and stores in the memory log information having a remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request, and a second interface portion that sends the created log information to another relay device after returning a response to the remote copy I/O request (as recited in independent claim 11).

2. U.S. Patent Publication No. 2004/0039888 A1

This reference discloses an automated storage replication processing when a disaster occurs, the state of the replication processing is determined, and a restart copy of the data is made available from the recover site. Processing continues based on whether protection mode is desired such that the system executes using the recovery site as the restart with a replicated copy of the data. A multi-hop configuration may use consistency group technology to provide protection of the production site in an offsite secondary site or "bunker site." The technique provides for consistent restartable copies at a remote restart site cyclically. It may be desirable to perform the process in an automated fashion to provide for continual creation of consistent copies of data as may be achieved with automation support. See [0094]-[0098].

The reference is directed to repeated cycles of consistent updates to provide for a restartable image of data at a remote site that is as current as possible in the event of a disaster of the production site. It does not, however, disclose the use of log information having a remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request. More specifically, the reference fails to teach sending/receiving log information having a remote copy I/O request to copy data from a first storage system to a second storage system and a sequential number indicating the order of reception of the remote copy I/O request, and sending the extracted/acquired remote copy I/O request to the second storage system according to the order indicated by the sequential number (as recited in independent claims 1 and 17); or a relay device having a processor that creates and stores

in the memory log information having a remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request, and a second interface portion that sends the created log information to another relay device after returning a response to the remote copy I/O request (as recited in independent claim 11).

3. U.S. Patent Publication No. 2003/0051111 A1

This reference discloses a remote copy control method, a storage sub-system with the method, and a large area data storage system using them. With the multi-hop method either synchronous transfers or asynchronous transfers are arbitrarily set for communication among the storage sub-systems. See [0198]. The storage subsystem 1 writes the target data in the logical volume (first storage resource), provides a sequence number in the order whereat the data writing process was performed, and stores the sequence number (in a predetermined table) in correlation with the write position information that specifies the storage location in the logical volume whereat the target data is written in step S122. The storage subsystem 1 transmits to the storage subsystem 2 the target data and the sequence number provided in step S123. The transmission of the data and the sequence number is performed between the storage subsystems after the data transmission command ahs been issued, and as needed, the data write position information is provided for the data transmission command. The storage subsystem 2 receives the target data to be written and the sequence number, and writes them to its own logical volume (second storage resource). See [0199]-[0202].

The reference is directed to consistent guaranteeing the order whereat a storage system has received data from a host in a remote copy operation. The reference discloses the use of a sequence number in the order whereat the data writing process was performed, but it does not teach the use of log information having a remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request. More specifically, the reference fails to teach sending/receiving log information having a remote copy I/O request to copy data from a first storage system to a second storage system and a sequential number indicating the order of reception of the remote copy I/O request, and sending the extracted/acquired remote copy I/O request to the second storage system according to the order indicated by the sequential number (as recited in independent claims 1

and 17); or a relay device having a processor that creates and stores in the memory log information having a remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request, and a second interface portion that sends the created log information to another relay device after returning a response to the remote copy I/O request (as recited in independent claim 11).

4. U.S. Patent No. 6,209,002 B1

This reference discloses a data storage facility for transferring data from a data altering apparatus, such as a production data processing site 21 to a remote data receiving site 22. The data storage facility includes a first data store 32 for recording each change in the data generated by the data altering apparatus. A register set records each change on a track-by-track basis. A second data store 34 has first and second operating modes. During a first operating mode the second data store becomes a mirror of the first data store. See column 4, line 64 to column 5, line 11. During a second operating mode the second data store ceases to act as a mirror and becomes a source for a transfer of data to the data receiving site. Only information that has been altered, i.e., specific tracks that have been altered, are transferred during successive operations in the second operating mode. Commands from the local production site initiate the transfers between the first and second operating modes. See column 5, lines 12-30.

The reference is directed to cascading data through redundant data storage units using two operation modes. It does not, however, disclose the use of log information having a remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request. More specifically, the reference fails to teach sending/receiving log information having a remote copy I/O request to copy data from a first storage system to a second storage system and a sequential number indicating the order of reception of the remote copy I/O request, and sending the extracted/acquired remote copy I/O request to the second storage system according to the order indicated by the sequential number (as recited in independent claims 1 and 17); or a relay device having a processor that creates and stores in the memory log information having a remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request, and a second interface

portion that sends the created log information to another relay device after returning a response to the remote copy I/O request (as recited in independent claim 11).

5. U.S. Patent No. 5,734,818

This reference relates to a remote data shadowing system 400 that provides storage based, real time disaster recovery capability. Record updates at a primary site 421 cause write I/O operations in a storage subsystem 406 therein. The write I/O operations are time stamped and the time, sequence, and physical locations of the record updates are collected in a primary data mover. The primary data mover groups sets of the record updates and associated control information based upon a predetermined time interval (record set information 600), the primary data mover appending a prefix header 500 to the record (updates thereby forming self describing record sets). The self describing record sets are transmitted to a remote secondary site 431 wherein consistency groups are formed such that the record updates are ordered so that the record updates can be shadowed in an order consistent with the order the record updates cause write I/O operations at the primary site. See Fig. 6; and column 9, line 51 to column 11, line 21. A consistency group can be formed at either the primary site 421 or secondary site 431. See Fig. 9.

The reference is directed to forming consistency groups using self-describing record sets for remote data duplexing. While it disclose consistent order for record updates, it does not teach the use of log information having a remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request. More specifically, the reference fails to teach sending/receiving log information having a remote copy I/O request to copy data from a first storage system to a second storage system and a sequential number indicating the order of reception of the remote copy I/O request, and sending the extracted/acquired remote copy I/O request to the second storage system according to the order indicated by the sequential number (as recited in independent claims 1 and 17); or a relay device having a processor that creates and stores in the memory log information having a remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request, and a second interface portion that sends the created log information to another relay device after returning a response to the remote copy I/O request (as recited in independent claim 11).

6. Japanese Patent Publication No. JP 2003-122509

This reference discloses a remote control method that always hold the sequence of updating data between three or more data centers. Two data centers existing neighboring place are connected using a copy function by simultaneous transfer. One of the data centers and a third data center existing in a remote place are connected by an asynchronous remote copy function, whereby a storage subsystem existing in a neighboring place always ensures the sequence of the data received from a host and the third data center holds the data. Further, each storage subsystem is provided with a function of grasping the progress state of transferring, receiving, and updating the data between the storage subsystems installed in two data centers which do not directly transfer data in normal operation.

The reference is directed to a multi-hop method that combines synchronous remote copying and asynchronous remote copying. See present application at page 2, lines 22-25. Because the method assumes that the owner of the storage devices manages intermediate devices, increases in the costs of device ownership and in management costs are problematic. See present application at page 3, lines 8. The reference does not disclose the use of log information having a remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request. More specifically, the reference fails to teach sending/receiving log information having a remote copy I/O request to copy data from a first storage system to a second storage system and a sequential number indicating the order of reception of the remote copy I/O request, and sending the extracted/acquired remote copy I/O request to the second storage system according to the order indicated by the sequential number (as recited in independent claims 1 and 17); or a relay device having a processor that creates and stores in the memory log information having a remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request, and a second interface portion that sends the created log information to another relay device after returning a response to the remote copy I/O request (as recited in independent claim 11).

7. Japanese Patent Publication No. JP 2000-305856

This reference relates to a technique to guarantee the sequence of update and the consistency of data by doubling data between disk subsystems on a main-center side and

a remote-center side through gateway subsystems. Data which are written from a host computer 1 are doubled between disk subsystems 3-1, 302, . . . , 3-n, and a gateway subsystem 5 and held macroscopically in the same state. The gateway subsystem 5 adds information for holding the sequence of update. Further, the data are doubled between the gateway subsystem 5 and a gateway subsystem 7 by asynchronous remote copying while the sequence of update is guaranteed. The disk subsystems 9-1, 9-2, . . . , 9-n have the data updated in synchronism with the update of the gateway subsystem 7. Those are all actualized only by the function of the disk subsystems and no new software need be introduced.

The reference is directed to a multi-hop method that combines synchronous remote copying and asynchronous remote copying. See present application at page 2, lines 22-25. Because the method assumes that the owner of the storage devices manages intermediate devices, increases in the costs of device ownership and in management costs are problematic. See present application at page 3, lines 8. The reference does not disclose the use of log information having a remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request. More specifically, the reference fails to teach sending/receiving log information having a remote copy I/O request to copy data from a first storage system to a second storage system and a sequential number indicating the order of reception of the remote copy I/O request, and sending the extracted/acquired remote copy I/O request to the second storage system according to the order indicated by the sequential number (as recited in independent claims 1 and 17); or a relay device having a processor that creates and stores in the memory log information having a remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request, and a second interface portion that sends the created log information to another relay device after returning a response to the remote copy I/O request (as recited in independent claim 11).

8. Japanese Patent Publication No. JP 07-244597

This reference relates to a technique to provide a remote data shadowing system which provides a real-time disaster recovery function on a storage area base. A write input-output operation is performed in a storage subsystem on the primary side 14 by record update on the primary side 14. A time-stamp is attached to this write input-output operation and the time, order and physical position of the record update are collected in a primary data

mover. The primary data mover divides plural sets of record update and their related control information into groups based on prescribed time intervals, adds a prefix header to the record update and thereby forms a self-description record set. The self-description record set is sent to a remote secondary side 15, and such a consistency group is formed that the record update is ordered to be able to shadow the record update in the sequence that matches the sequence where the write input-output operation was performed on the primary side 14 by the record update.

The reference is directed to the use of consistency group in disaster recovery. While it discloses matching the sequence where the write I/O operation was performed on the primary site by the record update in the secondary site, it does not teach the use of log information having a remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request. More specifically, the reference fails to teach sending/receiving log information having a remote copy I/O request to copy data from a first storage system to a second storage system and a sequential number indicating the order of reception of the remote copy I/O request, and sending the extracted/acquired remote copy I/O request to the second storage system according to the order indicated by the sequential number (as recited in independent claims 1 and 17); or a relay device having a processor that creates and stores in the memory log information having a remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request, and a second interface portion that sends the created log information to another relay device after returning a response to the remote copy I/O request (as recited in independent claim 11).

9. European Patent Publication No. EP 1049016 A2

This reference discloses an asynchronous remote copy system that can ensure the data renewal order and data integrity of the disk subsystems and are easy to be incorporated and free from degradation of the process performance by host computers (1, 11). To this end, in the remote copy system for data mirroring, a main center (12) has one gateway subsystem (5) and a remote center (13) has one gateway subsystem (7), and disk subsystems (3, 9) in each center to be remotely copied are connected to the corresponding gateway subsystem. Data is mirrored through synchronous type remote copy between a volume of the disk subsystem of each center to be remotely copied and a desired volume of the

corresponding gateway subsystem, and the gateway subsystem of the main center sends the renewal data to the gateway subsystem of the remote center in accordance with the order of renewal of volumes of the gateway subsystem of the main center, to make the gateway subsystem of the remote center reflect the renewal data upon the volumes thereof through asynchronous type remote copy. See Figs 4 and 5; and [0048]-[0052].

The reference is directed to maintaining order integrity by ensuring the same order of renewal of volumes of the gateway subsystem. While it discloses maintaining the order of renewal of volumes, it does not teach the use of log information having a remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request. More specifically, the reference fails to teach sending/receiving log information having a remote copy I/O request to copy data from a first storage system to a second storage system and a sequential number indicating the order of reception of the remote copy I/O request, and sending the extracted/acquired remote copy I/O request to the second storage system according to the order indicated by the sequential number (as recited in independent claims 1 and 17); or a relay device having a processor that creates and stores in the memory log information having a remote copy I/O request and a sequential number indicating the order of reception of the remote copy I/O request, and a second interface portion that sends the created log information to another relay device after returning a response to the remote copy I/O request (as recited in independent claim 11).

(f) In view of this petition, the Examiner is respectfully requested to issue a first Office Action at an early date.

Respectfully submitted,

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